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### VIII.—*Remarks on the Geographical Distribution of the Lacertilia.* By G. A. BOULENGER.

IN the present article I do not intend to give a detailed account of the geographical distribution of Lizards—a work which has to be postponed until the revision of all the genera and species is completed. But, general as these notes are, they will, I trust, be sufficient to establish an important fact, viz. the very great difference between the geographical distribution of Lizards and that of other groups of reptiles, and especially of the Batrachians, of whose distribution I have lately\* treated.

The accounts hitherto given of the geographical distribution of reptiles were founded upon material chiefly derived from the works of Duméril and Bibron and of Gray. It has already been pointed out how artificial many of the systematic groups adopted by these authors are, and I have recently endeavoured to replace them by a more natural arrangement. No one will deny that a classification based on osteological as well as external characters must lead to a better understanding of the affinities of animals—affinities which are so frequently concealed under superficial appearances.

\* *Cat. Batr. Grad. &c.* p. 105.

If we attempt to divide the globe as to its Batrachian fauna, two primary divisions present themselves, viz. a northern zone, comprising the Palæarctic and Nearctic Regions, and an equatorial southern zone. But for Lizards we have to draw a line from pole to pole, forming the Old World and Australia on the one hand, and America on the other, into primary divisions. And, proceeding to further subdivision, we find that the Ethiopian and Oriental or Indian Regions, which in their Batrachians are so closely related, have little in common as regards Lizards; whilst, on the contrary, the Oriental and Australian, so widely different in their Batrachians, are extremely similar. We find also that the Palæarctic or Europæo-Asiatic, the Batrachian fauna of which is so well characterized and without any affinity whatever to the Ethiopian, bears the closest resemblance to the latter region, differing only in the absence of various types which flourish in the tropical and subtropical zones. However, before proceeding to further remarks as to this division, I must give a synopsis of the ranges of the various families into which I have divided the order Lacertilia.

The two families Geckonidæ and Scincidæ may be left out, as, being composed of a very large number of genera which are distributed over the whole of the warmer parts of the world, they may be termed cosmopolitan. We must notice, however, that they both agree in being scantily represented in South America and abundantly in Australia. Dismissing also the small family Eublepharidæ, the extraordinary distribution of which (West Africa, Southern Asia from the Euphrates to Bengal, and Central America) is unparalleled, we retain the following families, which, owing to their more restricted range, throw greater light upon the subject. They may be divided into two groups: A. Small families, having a narrow range; B. Large and more widely distributed families:—

- A. *Uroplatidæ*. Madagascar.
- Pygopodidæ*. Australia.
- Xenosauridæ*. Central America.
- Zonuridæ*. South Africa and Madagascar.
- Aniellidæ*. California.
- Helodermatidæ*. Mexico.
- Xantusiidæ*. California, Central America, and Cuba.
- Gerrhosauridæ*. Africa and Madagascar.
- Anelytropidæ*. Africa.
- Dibamidæ*. New Guinea.
- B. *Agamidæ*. Most abundantly represented in the East Indies, less so in Australia, still less in Africa and

- Asia north of the Himalayas. Absent from Madagascar and New Zealand.
- Iguanidæ*. America. Two genera in Madagascar, and another in the Fiji Islands.
- Anguidæ*. The bulk of this family occupies Central America and the West Indies, spreading to North and South America. One genus (*Anguis*) in Europe and the Mediterranean district, another (*Pseudopus*) represented by one species in the Mediterranean district and one in the Khasia Hills.
- Varanidæ*. Africa (excl. Madagascar), Oriental Region to Asia Minor, Australia.
- Teiidæ*. America.
- Amphisbænidæ*. Tropical and subtropical America, Africa (excl. Madagascar), and the Mediterranean district.
- Lacertidæ*. Africa (excl. Madagascar), Europe, Asia, few in the East Indies.
- Chamæleontidæ*. Africa, most abundant in Madagascar, one species, identical with a North African, extending to India and Ceylon.

Passing now to an examination of the relationships between the various parts of the globe as to their Lizard-faunas we must first establish the two great primary divisions which have been alluded to above, and which, in accordance with Mr. Sclater's nomenclature\*, I will term the *Neogean* and *Palæogean* Realms. The former is characterized by the presence of the *Iguanidæ*, *Teiidæ*, and abundance of *Anguidæ*; the latter by *Agamidæ*, *Varanidæ*, *Lacertidæ*, and *Chamæleontidæ*. This division is the more natural, as we find in both realms, within their respective families, a repetition of the same forms having adapted themselves to similar conditions. Few more striking examples of parallel series of forms can be found than the families *Agamidæ* and *Iguanidæ*, or the *Lacertidæ* and *Teiidæ*. Such parallel series occur in almost every division of the animal kingdom: among the *Batrachia* we have the *Arcifera* and the *Firmisternia*; among the *Chelonia* the *Cryptodira* and the *Pleurodira*; and there can be no doubt that the indications furnished by the range of such analogous large groups are of the greatest importance in tracing the relationships of the faunas of the various parts of the world.

The *Neogean* Realm may, in this summary review, be described in few words. Its fauna is very uniform as

\* Journ. Linn. Soc. ii. 1857, p. 130.

regards groups of higher rank, and the changes from the centre towards the North and South are very gradual. And it is noteworthy that the Central-American fauna (of which the North-American is but an offshoot) presents a greater variety of types than South America; thus it possesses representatives of every one of the eleven families which occur in the realm, viz. Geckonidæ, Eublepharidæ, Iguanidæ, Xenosauridæ, Anguidæ, Aniellidæ, Helodermatidæ, Xantusiidæ, Teiidæ, Amphisbænidæ, and Scincidæ; whereas South America lacks the small groups Eublepharidæ, Xenosauridæ, Aniellidæ, Helodermatidæ, and Xantusiidæ. As the greater abundance and variety of forms of the Anguidæ occurs in the northern half and the West Indies, and the reverse is the case as regards the Teiidæ (especially with reference to variety of genera) and the Amphisbænidæ, we may safely draw the boundary-line between two regions or subregions, as it may be thought fit to term them, at the Isthmus of Panama, the West Indies being comprised with the northern region. Lizards range only as far north as British Columbia (*Gerhronotus cæruleus*), Minnesota (*Eumeces septentrionalis*), and Massachusetts (*Eumeces fasciatus*); whilst they have penetrated to the Straits of Magellan (*Liolaemus magellanicus*).

In the following remarks on the *Palaean Realm* Wallace's zoo-geographical division is followed, with the view of examining how far it agrees with the facts deducible from the distribution of the Lacertilia.

1. *The Palaearctic Region*.—There is no more reason for separating this region from Tropical Africa than there is for separating North from Tropical America. Its chief character is the abundance of Lacertidæ, which group is also richly represented, by identical or closely allied genera, throughout the continent of Africa. In the Oriental Region they disappear, being eastwards represented only by the aberrant genus *Tachydromus*, which is an Oriental form.

In Europe and the Mediterranean district Anguidæ occur, represented by two genera, viz. *Anguis*, which has its nearest ally in *Ophiodes* of South America, and *Pseudopus* (of which a second species is found in the Khasia hills), closely related to *Ophiosaurus* of North America. The occurrence of these American types is analogous to that of the Batrachian genus *Hyla* in the same region, and the fact that the Khasia hills are also the home of a distinct species of that genus is extremely remarkable; but this is the only analogy that can be found between the Batrachian and Lacertilian faunas of the Palaearctic Region. The Mediterranean districts of Africa and Asia, as well as the tract extending to North-western India,

are characterized by a mingling of European and Ethiopian forms, with, however, strong predominance of the latter—the true *Lacertæ* being outnumbered by such forms as *Eremias*, *Acanthodactylus*, &c., and the families Agamidæ, Amphisbænidæ, and Chamæleontidæ being represented by a greater or less number of species. The homogeneity of the desert-fauna which extends from North-west Africa to Sind is striking; not only the genera remain nearly the same, but even some of the species are identical throughout or but slightly modified.

African forms, such as the Lacertoid genera *Eremias* and *Scapteira*, penetrate into Central Asia and Mongolia; the genus *Phrynocephalus*, so characteristic of that district, is but a slightly modified form of the African *Agama*. By the abundance of these types, and by the absence of the genus *Lacerta*\* and the Anguidæ, the interior of Asia differs strongly from Europe, without showing any relationship to the Oriental Region; its character is essentially African. The Manchurian Subregion shows a decided preponderance of Indian forms, as is rendered especially apparent by the presence of several species of the genera *Gecko* and *Tachydromus*, which are otherwise restricted to the eastern parts of the Oriental Region, extending far into the Indian archipelago, but not ranging west of Bengal. Japan, with the widely-distributed genus *Eumeces* and the genera *Gecko* and *Tachydromus*, is without any affinity whatever to the Palæarctic Region—a fact in accordance with the distribution of Ophidians, as shown by Dr. Günther †, but different from that of Batrachians. The Manchurian Subregion is therefore to be included in the Oriental Region. The northern limit of the Lacertilia in Asia is still to be ascertained; in Europe they are known to occur as far as Lapland (*Lacerta vivipara* and *Anguis fragilis*).

2. *The Ethiopian Region.*—The affinity between this and the preceding region is so great, and the passage between the two so gradual, that it is hardly possible to draw any satisfactory boundary-line; should such a boundary have to be traced, the southern limit of the Sahara appears to be the most natural. The south of the African continent exhibits by far the most varied Lizard-fauna, no less than ten families (viz. Geckonidæ, Agamidæ, Zonuridæ, Varanidæ, Amphisbænidæ, Lacertidæ, Gerrhosauridæ, Scincidæ, Anelytropidæ, and Chamæleontidæ) being represented, the smaller of which

\* A single species, *Lacerta vivipara*, ranges far to the east in Northern Asia, its presence being recorded in Amoorland; how far *L. agilis* extends into Siberia is unknown at present; no other *Lacertæ* are known to occur in Siberia.

† Proc. Zool. Soc. 1858, p. 379.

(Zonuridæ, Gerrhosauridæ, Anelytropidæ) gradually disappear towards the north. As Africa shows some points of relation to Tropical America in certain Batrachians, such as the Aglossa, the Cæcilian genus *Dermophis*, so a point of similar affinity is suggested by the Amphisbænidæ, of which eight genera occur in Africa and five in America, two being common to both regions. The distribution of the Lacertilia does not afford any support to the divisions into the continental subregions proposed by Wallace. Madagascar is as differentiated from continental Africa in its Lizards as in its Batrachians, although it has less in common with the Oriental Region; we find likewise strictly American forms (the Iguanoid genera *Hoplurus* and *Chalarodon*) and a striking negative feature in the absence of such families as the Agamidæ, Amphisbænidæ, and Varanidæ; it possesses a peculiar family—the Uroplatidæ. The sole point by which affinity to the Oriental Region might be thought to be indicated consists in the presence in the Andaman Islands of a species of the Geckoid genus *Phelsuma*. But Madagascar has important elements in common with Africa, viz. the Chamæleontidæ (represented by twenty-four species, nearly half the number actually known), Gerrhosauridæ, and Zonuridæ. It should therefore be regarded as a subregion of the Ethiopian Region, having much in common with the latter, a little with South America, scarcely anything with the East Indies, and nothing with Australia.

It is remarkable that this region is relatively poor in arboreal lizards, these being almost exclusively represented by the Chameleons. The Agamoids, so rich in arboreal forms in the Oriental Region, are terrestrial in Africa (*Agama*, *Aporoscelis*, *Uromastix*), and so are also the few Iguanoids of Madagascar.

Although the distribution of minor groups is beyond the scope of this paper, the range of a few genera may be noticed, as affording strong support to the views advocated on the relationship of the Ethiopian and Palæartic Regions.

1. *Lacerta*. Three species in South Africa, four in Tropical Africa, about twelve in Europe and the circum-Mediterranean district.
2. *Tropidosaura*. Two or three species in South Africa, three in the circum-Mediterranean district.
3. *Eremias*. Numerous throughout Africa and South-western and Central Asia and Mongolia.
4. *Scapteira*. Two or three species in South Africa, two in Central Asia.

5. *Chalcides* \*. Ten species in Madagascar, one in South Africa, six in the circum-Mediterranean district.

3. *The Oriental Region*.—We have seen above that the Manchurian Subregion of the Palæarctic Region should form part of the Oriental. The northern boundary traced by Wallace appears otherwise satisfactory, save that the desert of North-western India belongs essentially to the Ethiopian Region. This region thus defined is poor as regards the number of families: these are the Geckonidæ, Eublepharidæ (in India only), Agamidæ, Varanidæ, Lacertidæ, and Scincidæ. We have noticed above the occurrence of *Pseudopus* (Anguidæ) in the Khasia hills.

It possesses also a representative of the Chamæleontidæ in India and Ceylon; but the fact that this unique species is identical with a North-African one clearly shows that it must be treated as an immigrant from the Ethiopian Region. For the same reason we may omit such genera as *Agama* and *Uromastix*, which occur in Northern India, and the Lacertoid genera *Ophiops* and *Cabrita*, which are merely outposts from the neighbouring region. The Lacertidæ, therefore, are restricted to a single Oriental genus, *Tachydromus*. The Geckonidæ and Scincidæ are cosmopolitan; the Eublepharidæ have such a range as to throw no light on the relationships of this with other regions; and, finally, the Agamidæ and Varanidæ occur in common with the Ethiopian and Australian Regions. The Oriental Region does not possess a single family of its own, a fact already pointed out for the Batrachians. The Agamoids, by the great number of genera, most of which are adapted to arboreal life, give a special feature to this region, especially when compared with Africa and Australia. The subdivisions into subregions proposed by Wallace appear to agree on the whole with the distribution of the Lacertilia; but this is a question that can only be elucidated by discussing the range of genera and species, and therefore does not fall within the scope of this preliminary note. As to the eastern limit of the Oriental Region, it is by no means easy to decide where it should be drawn. Wallace's line clearly does not answer in this case, for Celebes and the Moluccas are tenanted by a strictly Malayan lizard-fauna, without Australian element. The latter begins to appear in New Guinea, where the genera *Draco* and *Calotes* are absent; whilst the characteristic Australian family Pygopo-

\* = *Seps*, auct. nec Laur., + *Gongylus*.

didæ is represented in its southern parts; this great island must be regarded as the debatable ground between the Australian and Oriental Regions. But, as observed above, there is, as regards the Lizards, no fundamental difference between the two; they form a single great region, which may be divided into several subregions, but not into two primary divisions, as required for other groups of animals.

4. *The Australian Region.*—Only five families occur—two cosmopolitan (Geckonidæ and Scincidæ), two in common with Asia and Africa (Agamidæ and Varanidæ), and one characteristic (Pygopodidæ). In New Guinea occurs the small family Dibamidæ; and the Fiji Islands possess a genus of Iguanoids, *Brachylophus*, the nearest ally of which is perhaps the West-Indian *Cyclura*. The bulk of the fauna consists of the Geckonidæ and Scincidæ. The latter, as regards number of species and variety of forms are not surpassed or even equalled in any other part of the world, and the former are well represented, although less so than in the Oriental Region. In the islands of the South Pacific, New Zealand included, these two families only are found, but represented by numerous species, some of which are types of peculiar genera, usually showing but remote affinity to the continental forms. The Agamoids are mostly terrestrial, some semi-arboreal and semiaquatic. Special affinity with the Oriental Region is shown in the genera *Physignathus* (four species in Australia, two in Siam and Cochin China) and *Gonyocephalus* (numerous throughout the Malayan and Papuan islands, two species in Queensland). One of the most remarkable features of Australia is the small number of families, it being in this respect inferior to Europe, which possesses representatives of seven, a remark which applies also to the Batrachians, of which Australia has four families and Europe seven.

Thus we arrive at the conclusion that the zoo-geographical regions generally in use, and especially their degree of relationship to one another, receive little support from the study of the distribution of Lizards; that the distribution in zones, which is so satisfactorily shown by the Batrachians and the freshwater Fishes, is contrary to the plainest evidence as regards Lizards, which at the present time range more according to longitude; that the two great divisions originally proposed by Mr. Sclater, and derived from the study of passerine birds, hold good; and that, if a division of the world had to be framed according to the lizard-faunas, the primary divisions would be the following:—



I. *Palæogean Realm.*

Two regions:—1. *Occidental* (=Palæarctic Region, excl. the Manchurian Subregion, + Ethiopian Region of Wallace); 2. *Oriental* (=Oriental + Australian Regions of Wallace).

II. *Neogean Realm.*

Nearctic + Neotropical Regions.

IX.—*Second List of Reptiles and Batrachians from the Province Rio Grande do Sul, Brazil, sent to the Natural-History Museum by Dr. H. von Ihering\**. By G. A. BOULENGER.

THE following species, which were not contained in the first list, formed part of a large collection made by Dr. von Ihering at S. Lorenzo, on the southern border of the Lagoa dos Patos. As before, such species as have not been recorded from Rio Grande do Sul by Hensel are marked with an asterisk.

## REPTILIA.

## CHELONIA.

\*1. *Hydromedusa tectifera*, Cope.

*Hydromedusa Maximiliani*, Wagler, 1830, nec Mikan.

*Chelodina Maximiliani*, Dum. & Bibr. 1835.

*Hydromedusa tectifera*, Cope, 1869.

*Hydromedusa platanensis*, Gray, 1873.

*Hydromedusa Wagleri*, Günth. 1884.

Two specimens, adult male and young. In the latter, the nuchal is in contact with the first costal, whilst in the former it is so on one side only—a fact which justifies the view expressed in the above synonymy.

\*2. *Thalassochelys caretta* (L.).

## LACERTILIA.

## ANISOLEPIS, g. n. Iguanidarum.

Tympanum distinct. Body cylindrical; no dorso-nuchal crest. Dorsal lepidosis heterogeneous, keeled; ventral scales

\* Cf. Ann. & Mag. Nat. Hist. ser. 5, xv. pp. 191-196.